

**SCHOOL OF MATHEMATICS AND APPLIED STATISTICS
WOLLONGONG CAMPUS**

**MATH201 Multivariate and Vector Calculus
Autumn Session 2008**

Subject Coordinator/Lecturer: Dr Rod Nillsen, Room 15.G25
phone: 4221 3835
email: nillsen@uow.edu.au
website: <http://www.uow.edu.au/~nillsen>
consultation hours: to be notified

Subject prerequisites:

One of MATH101 or MATH188 or MATH283 or (a mark of at least 65 in MATH142 or MATH162) or enrolment in course code 762A.

This information sheet must be read in conjunction with the general information on educational issues and student matters provided in the document “Policies and Services of the University, Faculty and School” published by the School of Mathematics and Applied Statistics. A copy may be obtained from the subject coordinator or at <http://www.math.uow.edu.au/subjects/generic.shtml>

Lecturer and Outline of Subject

All lectures are given by the coordinator, Rod Nillsen (see details above).

Consultation times: to be advised

This subject extends the calculus of one variable to the calculus of more than one variable. It introduces the notion of the derivative of a function of several variables, and discusses the representation of the derivative by a matrix. The entries in this matrix are obtained by what are called partial derivatives of the function. The chain rule, maxima and minima, Taylor’s theorem and integration are discussed in the context of functions of several variables. The simplest of these functions is $z = f(x,y)$ which can also be taken as representing a surface in three dimensions. Hence, n dimensional vectors (that is elements of n -dimensional Euclidean space) are incorporated into the subject and links are made between vectors and the calculus of functions of several variables.

The vector calculus part of the subject is complementary to the work on differentiation and integration, and

develops it further. The discussion will include vector functions of several variables, vector fields, line, surface and volume integrals, general integral theorems, and some applications.

Notes and reference books

Students should purchase a copy of the notes “Multivariate and Vector Calculus ” by Rod Nillsen. These are available from the UniCentre Bookshop. Cost is \$17.40.

Reference books:

Adams R.A. Calculus of several variables, Addison-Wesley, 1987. 515.84/4
Kreyszig, E. Advanced Engineering Mathematics, Wiley, 7th Ed., 1993 and other editions. 510.262/5
Kaplan W. Advanced Calculus. Addison-Wesley, 4th Ed., 1991. 515/223
Lynn H. Loomis and Shlomo Sternberg, Advanced Calculus, Addison-Wesley, 1968. 515/71
M. Spivak, Calculus on Manifolds, W.A. Benjamin, New York, 1965 and later editions. 515.1/4.

J. Stewart, *Multivariable Calculus: concepts and contexts*, Thomson, Belmont CA, 2005. Library call number 515/288.

You are not required to purchase reference books. Several copies of all these books are available in the Library. Note that some of these books will be placed in closed reserve. Also, not all in any one of these books is necessarily relevant or at the appropriate level for the course. These readings are recommended only and are not intended to be an exhaustive list. You may use the Library catalogue and databases to locate additional readings with similar titles and contents. Further comments are in the notes to be purchased.

Notices

There is a notice board for MATH201 located in the southern wing of the second floor of Building 15 (Austin Keane Building). You are responsible for reading all notices placed on this notice board. Notices will be put on the notice board in week 1. After that, all other notices and any additional material will be accessible on the web by going to <http://www.uow.edu.au/~nillsen> and then select the [Math201 page](#). Most files on the web will be in pdf format for downloading. *You should visit this site on a regular basis.* Also, you will be informed of necessary information, as required, in lectures. Notices may also be sent to students using SOLS email.

Subject Learning Outcomes

The following are indicative. A student who successfully completes this subject should be able to:

- i) demonstrate knowledge of the notion of a function, its properties and its derivative, as appropriate, including definitions;
- ii) demonstrate knowledge of n -dimensional vectors, inner products, cross products and related properties of vectors, including definitions;
- iii) calculate partial derivatives of functions of several variables;
- iv) calculate partial derivatives of functions of several variables using

the chain rule and prove identities involving partial derivatives;

- v) use polar coordinates to calculate derivatives and integrals in two dimensions;
- vi) demonstrate knowledge of the definition and geometrical meaning of the integral of a function of one or two variables;
- vii) calculate integrals where the variables undergo transformation, using the Jacobian of the transformation;
- viii) calculate maxima and minima of a function, also when the function is subject to constraints;
- ix) calculate Taylor series for functions of several variables;
- x) differentiate and integrate over surfaces and volumes;
- xi) demonstrate knowledge of vector fields and related concepts, and be able to calculate with them;
- xii) demonstrate an appreciation of the conceptual framework and ideas in multivariate and vector calculus by, for example, being able to give definitions of notions and concepts, state results precisely, and by giving some proofs.

Lectures & Tutorials

Lectures for Math201 are at the following times.

Lectures 1&2 Monday 16:30 to 18:30, Room 20.2

Lecture 3 Wednesday 8:30 to 9:30, Room 35.G20

You will be assigned to a tutorial group, with tutorials starting in week 2. The groups are at the following times:
Wednesday 9.30 to 10.30, Room 41.104
Thursday 15.30 to 16.30, Room 19.2102
Thursday 16.30 to 17.30 Room 3.122
Friday 9.30 to 10.30, Room 41.107

Tutorials will begin in week 2

Tutorial lists, once allocated, will be on the Mathematics 200-level Notice Board in building 15. Attendance records for each tutorial will be maintained by tutors and passed to the coordinator.

Assessment

Your final mark in MATH201 will be determined as follows:*

1 one hour mid session test–	20%
1 assignment –	10%
Final Exam–	70%
Total–	100%

****Attendance at tutorial classes and lectures may be taken into account.***

Scaling of marks is **not** a standard procedure in this subject.

Note that you are not required to “pass” each individual component of the assessment to receive a Pass grade in MATH201. However, you should aim to be successful in every component of the assessment.

Calculators

Please note that single-line-display calculators are permitted in examinations for this subject. They must not have alphanumeric keyboards (or capabilities) and they must not be programmable in any way. If you are not sure whether your calculator is acceptable, have it checked well before any exam.

Final Examination

The final examination in MATH201 will be as follows:

Duration: 3 hours and 15 minutes
Value: 70% of final mark.

The examination will be held during the examination period at the end of Autumn Session in June, at a time to be advised by the University. As a student enrolled in the University of Wollongong, you are required to be available for the entire

examination period in June.

Mid-Session Test

The Mid-Session test for MATH201 will be as follows:

Date: Monday 21st April 2007 (week 8)
Time: 16.30—17.30
Location: 20.2
Duration: 1 hour
Value: 20% of final mark

If you are unable to attend the test *you should contact the subject coordinator as soon as possible*. Any request for special consideration regarding the test *must be received by the subject coordinator within 7 days of the test*.

Assignment

There is one assignment.

The assignment: is worth 10% of the final mark.

The assignment: will be handed out at the end of the Monday Lecture of week 10, May 5th.

The assignment will be due by 5pm, Monday in week 12, May 19th.

The assignment should be placed by the due time in the MATH201 assignment box in the northern wing of building 15, near room 15.107.

The questions on the assignment will have marks indicated and will be graded accordingly.

It is intended that marked assignments will be handed back in tutorials or in a lecture in week 13.

Please note the following:

- You must show working for each question on the assignment.
- Untidy or illegible work will not necessarily be assessed
- Assignments will **not** be accepted outside classes or after the due date—unless you are successful in applying for special consideration (see later).
- Faxed or emailed assignments will not be accepted. You must submit your assignment as described above, or if given special consideration, in person.
- You should keep a copy of all work

submitted.

If you wish to seek special consideration for a late assignment, you must apply for special consideration via SOLS, submit your documentation to the University Administration and then you should obtain a Special Consideration Form from the School Admin Assistant (Room 15.110). Submit the assignment with the completed form to the Admin as early as possible. In any case, assignments submitted more than 7 days after the original due date will not generally be accepted and other arrangements may be necessary. In this instance, contact the subject coordinator immediately.

Cheating and Plagiarism

The University does not tolerate cheating or plagiarism and regards them very seriously. For more information, see the document “Policies and Services of the University, Faculty and School” and the section in the University Undergraduate Handbook entitled “Acknowledgement Practice/Plagiarism”, or visit

<http://www.uow.edu.au/handbook/course/rules/plagiarism.html>

Consultation

If you are having any difficulties with MATH201, you are encouraged to seek advice from the subject coordinator.

If you cannot come at the listed consultation times, contact the subject coordinator to arrange an appointment at a mutually convenient time.